

In re the Rule 53(b) Continuation Application of: **Minoru KAKINUMA et al.**

S/N 09/204,276 Filed December 3, 1998

Preliminary Amendment

Attorney Docket No. 981414A

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Original): An electronic camera comprising:

 a single image pickup device having an electronic shutter function capable of desirably controlling exposure amount by controlling charge accumulating time; and
 means for shutting off light from a light receiving surface of the image pickup device; and

 image pickup signal of smaller exposure amount generated by using the electronic shutter function of said image pickup device;

 image pickup signal of larger exposure amount thereafter generated by controlling charge accumulating time of the image pickup device by the means for shutting off light;

 the two image pickup signals synthesized to obtain an image having an increased wide dynamic range;

 said electronic camera effecting control of charge accumulating time of the image pickup device by said means for shutting off light through operation from opened state to closed state of the means for shutting off light and further comprising:

 shading correction means for correcting shading resulting from difference in charge accumulating time among the pixels of the image pickup device occurring due to the operation toward said closed state of the means for shutting off light.

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Claim 2 (Original): An electronic camera comprising:

a single image pickup device having an electronic shutter function capable of desirably controlling exposure amount by controlling charge accumulating time; and means for shutting off light from a light receiving surface of the image pickup device; and

image pickup signal of smaller exposure amount generated by using the electronic shutter function of said image pickup device;

image pickup signal of larger exposure amount thereafter generated by controlling charge accumulating time of the image pickup device by the means for shutting off light;

the two image pickup signals synthesized to obtain an image having an increased wide dynamic range;

said means for shutting off light comprising a focal-plane shutter, shutter charge of the focal—plane shutter effected immediately after a completion of electronic shutter's operation of said image pickup device in the state where charge accumulating operation of the image pickup device being halted, and charge accumulating operation of the image pickup device started after completion of the shutter charge so as to effect control of a charge accumulating time by a normal focal—plane shutter operation.

Claim 3 (Original): An electronic camera comprising:

a single image pickup device having an electronic shutter function capable of desirably controlling exposure amount by controlling charge accumulating time;

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means for shutting off light from a light receiving surface of the image pickup device;

means for generating from said image pickup device two image pickup signals of the same object differing from each other in exposure amount; and

synthesizing means for obtaining an image having an increased wide dynamic range by performing synthesis of the two image pickup signals obtained by the means for generating image pickup signal; and

said means for generating image pickup signal:

generating image pickup signal of larger exposure amount by controlling charge accumulating time of the image pickup device by the means for shutting off light after generating image pickup signal of smaller exposure amount by using the electronic shutter function of the image pickup device if charge accumulating time of the image pickup device for obtaining image pickup signal of larger exposure amount is set as shorter than a time period required for readout of all the pixels of the image pickup device; and

generating image pickup signal of larger exposure amount by using the electronic shutter function of the image pickup device instead of said means for shutting off light if charge accumulating time of the image pickup device for obtaining image pickup signal of larger exposure amount is set as longer than the time period required for readout of all the pixels of the image pickup device.

Claim 4 (Original): An electronic camera having a function for performing synthesis of two image pickup signals obtained by

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performing by a single image pickup device two shots of picture taking of different exposure amount of the same object to obtain an image having an increased wide dynamic range, said electronic camera comprising:

a photometric device having a separate entity from the image pickup device; and means for setting charge accumulating time of the image pickup device at a second shot of picture taking corresponding to a previously set exposure amount ratio of the two shots of picture taking based on an exposure amount measured by said photometric device at a first shot of picture taking.

Claim 5 (Original): An electronic camera having a function for performing synthesis of two image pickup signals obtained by performing by a single image pickup device two shots of picture taking of different exposure amount of the same object to obtain an image having an increased wide. dynamic range, said electronic camera comprising:

flash emission means, said flash emission means caused to emit at one or both of a timing in the second half of charge accumulating time of the image pickup device at a first shot of picture taking and a timing in the first half of charge accumulating time of the image pickup device at a second shot of picture taking.

Claim 6 (Original): The electronic camera according to claim 5, further comprising:
a photometric device having a separate entity from the image pickup device; and

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means for causing said flash emission means to emit at both of the two shots of picture taking and setting charge accumulating time of the image pickup device at the second shot of picture taking based on an emission amount ratio of the two emissions measured by said photometric device.

Claim 7 (Original): The electronic camera according to claim 5, wherein said image pickup device includes an electronic shutter function capable of desirably controlling an exposure amount by controlling charge accumulating time, said flash emission means caused to emit at both of the two shots of picture taking and, at a smaller emission of the two emissions of the flash emission means, timing for stopping the smaller emission being set as the same as the timing for terminating an electronic shutter operation of the image pickup device.

Claim 8 (Original): An electronic camera having a function for performing synthesis of two image pickup signals obtained by performing by a single image pickup device two shots of picture taking of different exposure amount of the same object to obtain an image having an increased wide dynamic range, said electronic camera comprising:

means for setting diaphragm stop value of lens fixed at said two shots of picture taking.

Claim 9 (Original): The electronic camera according to claim 8, further comprising exposure setting means, a diaphragm stop value and/or shutter speed obtained by said exposure setting means before taking picture being used at the picture taking for obtaining image pickup

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signal of larger exposure amount and, at the picture taking for obtaining image pickup signal of smaller exposure amount, the same diaphragm stop value being used and shutter speed being set correspondingly to a previously set exposure amount ratio of the two shots of picture taking.

Claim 10 (Original): The electronic camera according to claim 9, wherein said exposure setting means sets an exposure value based on photometric output of a photometric device provided separately from the image pickup device.

Claim 11 (Original): The electronic camera according to claim 9, wherein said exposure setting means sets an exposure value based on image pickup signal of the image pickup device.

Claim 12 (Original): An electronic camera having a function for performing synthesis of two image pickup signals obtained by performing by a single image pickup device two shots of picture taking of different exposure amount of the same object to obtain an image having an increased wide dynamic range, said electronic camera comprising:

means for performing white balance correction for the two image pickup signals of different exposure amount before performing said synthesis by setting the same white balance correction value.

Claim 13 (Original): The electronic camera according to claim 12, further comprising a white balance setting means, wherein white balance correction value obtained by said white

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balance setting means before picture taking is used in white balance correction by said white balance correction means.

Claim 14 (Original): The electronic camera according to claim 12, wherein the correction value to be used in said white balance correction means is set based on image pickup signal before performing said synthesis.

Claim 15 (Original): The electronic camera according to claim 14, wherein the correction value to be used in said white balance correction means is set based on the image pickup signal of larger exposure amount of the two image pickup signals of different exposure amount before performing said synthesis.

Claim 16 (Original): An electronic camera having a function for performing synthesis of two image pickup signals obtained by performing by a single image pickup device two shots of picture taking of different exposure amount of the same object to obtain an image having an increased wide dynamic range, said electronic camera comprising:

means for correcting white balance with respect to said synthesized image having a wide dynamic range.

Claim 17 (Original): The electronic camera according to claim 16, further comprising a white balance setting means, wherein white balance correction value obtained by said white

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balance setting means before picture taking is used in white balance correction by said white balance correction means.

Claim 18 (Original): The electronic camera according to claim 16, wherein the correction value to be used in said white balance correction means is set based on said synthesized image having a wide dynamic range.

Claim 19 (Original): The electronic camera according to claim 16, wherein the correction value to be used in said white balance correction means is set based on image pickup signal before performing said synthesis.

Claim 20 (Original): The electronic camera according to claim 19, wherein the correction value to be used in said white balance correction means is set based on the image pickup signal of larger exposure amount of the two image pickup signals of different exposure amount before performing said synthesis.

Claim 21 (Original): An electronic camera having a function for performing synthesis of two image pickup signals obtained by performing by a single image pickup device two shots of picture taking of different exposure amount of the same object to obtain an image having an increased wide dynamic range, said electronic camera comprising:

gain control means, gain values at said gain control means for said two image pickup signals being respectively set to values differing from each other.

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Claim 22 (Original): The electronic camera according to claim 21, wherein the gain values for said two image pickup signals are set such that the exposure amount ratio of the two image pickup signals corresponds to a previously set exposure amount ratio.

Claim 23 (Original): An electronic camera having a function for performing synthesis of two image pickup signals obtained by performing by a single image pickup device two shots of picture taking of different exposure amount of the same object to obtain an image having an increased wide dynamic range, said electronic camera comprising:

diaphragm control means, said two image pickup signals of different exposure amount being generated by changing diaphragm stop value of lens by the diaphragm control means.

Claim 24 (Original): The electronic camera according to claim 23, further comprising means for correcting peripheral attenuation of lens, wherein correction with respect to peripheral attenuation occurring due to difference in diaphragm stop value of lens is performed for said two image pickup signals of different exposure amount generated by changing diaphragm stop value of lens by said diaphragm control means.

Claim 25 (Original): The electronic camera according to claim 23 or 24, further comprising flash emission means, wherein the flash emission means effects flash emissions of the same emission amount at said two shots of picture taking of different exposure amount and said

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two image pickup signals of different exposure amount are generated by changing the diaphragm stop value of lens by said diaphragm stop value control means.

Claim 26 (Original): An electronic camera comprising color image synthesizing means for forming a color image having a wide dynamic range by synthesizing a plurality of color image signals of different exposure amount, said electronic camera further comprising:

weighting means for assigning weights to said plurality of color image signals corresponding to their respective signal level; and

means for adding the plurality of weighted color image signals; and

said weighting means setting the same weighting factor respectively for each color signal in said plurality of color image signals.

Claim 27 (Original) An electronic camera comprising:

optical means for forming an optical image of object of picture taking;

image pickup means for generating image pickup signals by taking picture and effecting photoelectric conversion of an image of the object formed at the optical means;

flash emission means for illuminating the object;

exposure condition designating means for designating exposure conditions at said image pickup means;

image pickup signal synthesizing means for synthesizing two image pickup signals from two separate shots of picture taking at said image pickup means by exposure conditions designated by the exposure condition designating means;

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flash emission control means for controlling emission of said flash emission means in connection with the exposure conditions with respect to each shot at the time of said two shots of picture taking; and

control means for controlling operation of each of the foregoing means.

Claims 28 - 29 (Canceled).

Claim 30 (Currently Amended) The electronic camera according to claim 27 ~~or 28~~, wherein said flash emission means comprises a single charge storage means for accumulating emission energy of the flash emission means such that the total of emission amounts at the two shots of picture taking of the flash emission means is set equal to or lower than the total emission energy of said single charge storage means.

Claim 31 (Currently Amended): The electronic camera according to claim 27 ~~or 28~~, wherein said flash emission means comprises a plurality of charge storage means differing from each other in capacitance value for accumulating emission energy of the flash emission means such that a full emission of the flash emission means is caused at each of the two shots of picture taking by selectively using the plurality of charge storage means so as to make a difference in the total capacitance values to be respectively used.

Claim 32 (Currently Amended): The electronic camera according to claim 27 ~~or 28~~, wherein said flash emission means comprises a plurality of charge storage means for accumulating emission energy of the flash emission means such that one picture taking is performed by a smaller

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emission based on a full emission using one single or a plurality of charge storage means and the other picture taking is performed by a larger emission based on an emission under dimming control using the other single or plurality of charge storage means.

Claim 33 (Currently Amended): The electronic camera according to claim 27 or 28, wherein said flash emission means comprises a plurality of charge storage means for accumulating emission energy of the flash emission means such that one picture taking is performed by a smaller emission based on an emission under dimming control using one single or plurality of charge storage means and the other picture taking is performed by a larger emission based on a full emission using the other single or plurality of charge storage means.

Claim 34 (Currently Amended): The electronic camera according to claim 27 or 28, wherein said flash emission means includes at least one charge storage means for accumulating emission energy of the flash emission means such that the two shots of picture taking are performed as illuminated by a smaller emission and a larger emission each based on an emission under dimming control.

Claim 35 (Original): The electronic camera according to claim 32, wherein said dimming control is effected by control of emission time of said flash emission means.

Claim 36 (Original): The electronic camera according to claim 33, wherein said dimming control is effected by control of emission time of said flash emission means.

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Claim 37 (Original): The electronic camera according to claim 34, wherein said dimming control is effected by control of emission time of said flash emission means.

Claim 38 (Original): The electronic camera according to claim 32 further comprising a photometry means, said dimming control being effected based on detection of a predetermined emission amount by direct photometry of said photometry means.

Claim 39 (Original): The electronic camera according to claim 33 further comprising a photometry means, said dimming control being effected based on detection of a predetermined emission amount by direct photometry of said photometry means.

Claim 40 (Original): The electronic camera according to claim 34 further comprising a photometry means, said dimming control being effected based on detection of a predetermined emission amount by direct photometry of said photometry means.

Claim 41 (Original): The electronic camera according to claim 32, wherein said dimming control is effected based on measurement and detection of a predetermined voltage at the charge storage means.

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Claim 42 (Original): The electronic camera according to claim 33, wherein said dimming control is effected based on measurement and detection of a predetermined voltage at the charge storage means.

Claim 43 (Original): The electronic camera according to claim 34, wherein said dimming control is effected based on measurement and detection of a predetermined voltage at the charge storage means.

Claim 44 (Original): The electronic camera according to claim 32, wherein, when dimming is to be effected of the flash emission means at the second shot of picture taking, an emission amount of light from the flash emission means at the first shot of picture taking is measured and an emission amount under dimming control of the flash emission means at the second shot is set based on the measured emission amount so as to correspond to a previously set emission amount ratio of the flash emission means between the two shots of picture taking.

Claim 45 (Original): The electronic camera according to claim 33, wherein, when dimming is to be effected of the flash emission means at the second shot of picture taking, an emission amount of light from the flash emission means at the first shot of picture taking is measured and an emission amount under dimming control of the flash emission means at the second shot is set based on the measured emission amount so as to correspond to a previously set emission amount ratio of the flash emission means between the two shots of picture taking.

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Claim 46 (Original): The electronic camera according to claim 34, wherein, when dimming is to be effected of the flash emission means at the second shot of picture taking, an emission amount of light from the flash emission means at the first shot of picture taking is measured and an emission amount under dimming control of the flash emission means at the second shot is set based on the measured emission amount so as to correspond to a previously set emission amount ratio of the flash emission means between the two shots of picture taking.

Claim 47 (Original): The electronic camera according to claim 44 further comprising a photometry means, the emission amount of the flash emission means at the first shot of picture taking being measured by direct photometry of said photometry means.

Claim 48 (Original): The electronic camera according to claim 45 further comprising a photometry means, the emission amount of the flash emission means at the first shot of picture taking being measured by direct photometry of said photometry means.

Claim 49 (Original): The electronic camera according to claim 46 further comprising a photometry means, the emission amount of the flash emission means at the first shot of picture taking being measured by direct photometry of said photometry means.

Claim 50 (Original): The electronic camera according to claim 44, wherein the emission amount of the flash emission means at the first shot of picture taking is obtained by a voltage measurement at said charge storage means.

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Claim 51 (Original): The electronic camera according to claim 45, wherein the emission amount of the flash emission means at the first shot of picture taking is obtained by a voltage measurement at said charge storage means.

Claim 52 (Original): An electronic camera according to claim 46, wherein the emission amount of the flash emission means at the first shot of picture taking is obtained by a voltage measurement at said charge storage means.

Claim 53 – 61 (Canceled).

Claim 62 (Currently Amended): The electronic camera according to claim 27 ~~or 28~~, wherein said flash emission means comprises one xenon emission tube and one charge storage means and is caused to emit at the two shots of picture taking by using the one xenon emission tube and the one charge storage means.

Claim 63(Currently Amended): The electronic camera according to claim 27 ~~or 28~~, wherein said flash emission means comprises one xenon emission tube, a plurality of charge storage means and charge storage means switching means and is caused to emit at the two shots of picture taking by using the one xenon emission tube and at least one of the charge storage means switched and selected by the charge storage means switching means.

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Claim 64 (Currently Amended): The electronic camera according to claim 27 or 28, wherein said flash emission means comprises a plurality of xenon emission tubes, one charge storage means and xenon emission tube switching means and is caused to emit at the- two shots of picture taking by using at least one xenon emission tube switched and selected by said xenon emission tube switching means and the one charge storage means.

Claim 65 (Currently Amended): The electronic camera according to claim 27 or 28, wherein said flash emission means comprises a plurality of xenon emission tubes, a plurality of charge storage means, xenon emission tube switching means and charge storage means switching means and is caused to emit at the two shots of picture taking by using at least one xenon emission tube switched and selected by said xenon emission tube switching means and at least one charge storage means switched and selected by the charge storage means switching means.

Claim 66 (Original): The electronic camera according to claim 62, wherein said charge storage means comprises one main capacitor.

Claim 67 (Original): The electronic camera according to claim 63, wherein said charge storage means comprises one main capacitor.

Claim 68 (Original): The electronic camera according to claim 64, wherein said charge storage means comprises one main capacitor.

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Claim 69 (Original): The electronic camera according to claim 65, wherein said charge storage means comprises one main capacitor.

Claim 70 (Original): The electronic camera according to claim 62, wherein said charge storage means comprises a plurality of main capacitors connected in parallel.

Claim 71 (Original): The electronic camera according to claim 63, wherein said charge storage means comprises a plurality of main capacitors connected in parallel.

Claim 72 (Original): The electronic camera according to claim 64, wherein said charge storage means comprises a plurality of main capacitors connected in parallel.

Claim 73 (Original): The electronic camera according to claim 65, wherein said charge storage means comprises a plurality of main capacitors connected in parallel.

Claim 74 (Currently Amended): The electronic camera according to claim 27 or 28, wherein each emission of the flash emission means at the two shots of picture taking is effected as a single emission.

Claim 75 (Currently Amended): The electronic camera according to claim 27 or 28, wherein the respective emissions of the flash emission means at the two shots of picture taking are

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effected either as one unit emission and a collection of a plurality of times of unit emission or each as a collection of a plurality of times of unit emission.

Claim 76 (Currently Amended): The electronic camera according to claim 27 ~~or 28~~, wherein the respective emissions of the flash emission means at the two shots of picture taking are effected as a smaller emission and a larger emission in that order.

Claim 77 (Currently Amended): The electronic camera according to claim 27 ~~or 28~~ further comprising range finding means, an emission of said flash emission means being controlled to an optimum emission amount corresponding to a distance information obtained by said range finding means.

Claim 78 (Original): The electronic camera according to claim 77, wherein the emission to be controlled correspondingly to said distance information is a smaller emission.

Claim 79 (Currently Amended): The electronic camera according to claim 27 ~~or 28~~ further comprising pre-photometry means, an emission of said flash emission means being controlled by using a pre-photometry information obtained by said pre-photometry means.

Claim 80 (Currently Amended): The electronic camera according to claim 27 ~~or 28~~ further comprising pre-photometry means, an emission of said flash emission means being controlled by

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using a pre-photometry information obtained at said pre-photometry means by causing a pre-emission of the flash emission means.

Claim 81 (Orginal): The electronic camera according to claim 79, wherein said pre-photometry means comprises external photometry means.

Claim 82 (Original): The electronic camera according to claim 80, wherein said pre—photometry means comprises external photometry means.

Claim 83 Original): The electronic camera according to claim 79, wherein said pre-photometry means is used in common as said image pickup means.

Claim 84 (Original): The electronic camera according to claim 80, wherein said pre-photometry means is used in common as said image pickup means.